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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:

Applicants	:	Gade et al.
Serial No.	:	10/696,517
Filed	:	October 29, 2003
Title	:	CONTROL OF MAGNETORHEOLOGICAL MOUNT
Docket	:	DP-304939
Examiner	:	Ronnie M. Mancho
Art Unit	:	3664

Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

APPEAL BRIEF

Sir:

This is an appeal from the rejections presented in the final Office action mailed on May 30, 2008 and maintained in the advisory action mailed on July 29, 2008. A timely notice of appeal was filed on August 28, 2008.

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REAL PARTY IN INTEREST:

Applicants, Prasad V. Gade, Sanjiv G. Tewani and Thomas A. Baudendistal, have assigned the present patent application to Delphi Technologies, Inc. A copy of the assignment document was recorded in the United States Patent and Trademark Office at Reel 015058, Frame 0705 on March 8, 2004. Therefore, Delphi Technologies, Inc. is the real party in interest.

RELATED APPEALS AND INTERFERENCES:

The assignee and undersigned attorney are not aware of any other appeals or interferences that directly affect or will be directly affected by, or are related to or have a bearing on, the Board's decision in this pending appeal.

STATUS OF CLAIMS:

Claims 24-30 and 38-46 stand finally rejected and are being appealed. Claims 1-23 and 31-37 have been cancelled during prosecution.

STATUS OF AMENDMENTS:

An amendment was filed on July 8, 2008 presenting new claim 47 and cancelling claim 46 subsequent to final rejection. As indicated in the advisory action mailed on July 29, 2008, the amendments after final have not been entered.

SUMMARY OF CLAIMED SUBJECT MATTER:

Independent claim 24 is directed to a method for controlling a hydraulic mount between an object and a base, the object having a bounce resonance frequency. (P. 7, ll. 14-19.) A first step of the method requires calibrating at least one tunable parameter of a control system of the mount based on the bounce resonance frequency of the object. (P. 12, l. 16 to p. 13, l. 5; Figs. 4a and 4b.) A second step of the method requires generating a first acceleration signal indicative of an acceleration of the object. (P. 8, ll. 23-25.) A third step of the method requires generating a second acceleration signal indicative of an acceleration of the base. (P. 8, ll. 23-25.) A fourth step of the method requires determining a relative acceleration across the mount based on the first and second acceleration signals. (P. 8, ll. 23-25.) A fifth step of the method requires generating a control signal responsive to the determined relative acceleration based on the at least one tunable parameter. (P. 10, ll. 21-27; Fig. 3.) A sixth step of the method requires controlling the flow of MR mount fluid in the mount responsive to the control signal to minimize the relative acceleration across the mount over a predetermined band of frequencies. (P. 9, ll. 4-8.)

Independent claim 38 is directed to a system for controlling a hydraulic mount between an object and a base, the object having a bounce resonance frequency (p. 7, ll. 14-19), the system including means for modifying (a means-plus-function limitation, the corresponding structure being the control algorithm 400 shown in Figs. 4a and 4b) at least one tunable parameter of a control system of the mount based on the bounce resonance frequency of the object (p. 12, l. 16 to p. 13, l. 5; Figs. 4a and 4b), means for generating (a means-plus-function limitation, the corresponding structure being the engine accelerometers 12, 52 shown in Fig. 1) a first acceleration signal indicative of an acceleration of said object (p. 8, ll. 23-25), means for generating (a means-plus-function limitation, the corresponding structure being the body accelerometers 13, 53 shown in Fig. 1) a second acceleration signal indicative of an acceleration of said base (p. 8, ll. 23-25), means for determining (a means-plus-function limitation, the corresponding structure being the controllers 30, 40 shown in Fig. 1) a relative acceleration across the mount based on the first and second acceleration signals (p. 8, ll. 23-25), means for generating (a means-plus-function limitation, the corresponding structure being the control loop structure 300 shown in Fig. 3) a control signal responsive to the relative acceleration based on

the at least one tunable parameter (p. 10, ll. 21-27; Fig. 3), and means for controlling (a means-plus-function limitation, the corresponding structure being the controllers 30, 40 shown in Fig. 1) the flow of MR fluid in the mount responsive to the control signal to minimize the relative acceleration across the mount over a predetermined band of frequencies (p. 9, ll. 4-8).

Independent claim 45 is directed to a control system for a hydraulic mount positioned between a vibrating object and a base, the vibrating object having a bounce resonance frequency (p. 7, ll. 14-19), the system including means for generating (a means-plus-function limitation, the corresponding structure being the engine accelerometers 12, 52 shown in Fig. 1) a first acceleration signal indicative of an acceleration of said object (p. 8, ll. 23-25), means for generating (a means-plus-function limitation, the corresponding structure being the body accelerometers 13, 53 shown in Fig. 1) a second acceleration signal indicative of an acceleration of said base (p. 8, ll. 23-25), means for determining (a means-plus-function limitation, the corresponding structure being the controllers 30, 40 shown in Fig. 1) a relative acceleration across the mount based on the first and second acceleration signals (p. 8, ll. 23-25), means for generating (a means-plus-function limitation, the corresponding structure being the control loop structure 300 shown in Fig. 3) a control signal corresponding to the relative acceleration (p. 10, ll. 21-27; Fig. 3), means for controlling (a means-plus-function limitation, the corresponding structure being the controllers 30, 40 shown in Fig. 1) the flow of MR fluid in the mount responsive to the control signal (p. 9, ll. 4-8), means for tuning (a means-plus-function limitation, the corresponding structure being the control algorithm 400 shown in Figs. 4a and 4b) the control system to minimize the relative acceleration across the mount at and around the bounce resonance frequency of the object (p. 12, l. 16 to p. 13, l. 5; Figs. 4a and 4b).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

(A) Claims 24-30 and 38-46 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,060,919 to Takano et al. (the "Takano reference").

ARGUMENT:

A. CLAIMS 24-30 AND 38-46 ARE NOT ANTICIPATED BY THE TAKANO REFERENCE

For the purposes of the following argument, claims 24-30 and 38-46 will be treated as a single group, with claim 24 being representative.

Claims 24-30 and 38-46

Traditionally, engine mounts were designed to minimize the transmission of vibrations from the engine at the bounce resonance frequency. (P. 1, ll. 19-21.) However, the bounce resonance frequency of a particular vehicle depends on the specific body and engine characteristics of the vehicle. (P. 1, ll. 22-23.) Therefore, any design change in the vehicle body or engine may change the bounce resonance frequency, thereby requiring a physically redesigned mount. (P. 1, ll. 23-24.)

The claims of the present application are directed to the control of a hydraulic mount based upon the relative acceleration between a mounted object and a base. (P. 6, ll. 13-18.) The control system that controls the mount includes at least one tunable parameter that is calibrated based upon the bounce resonance frequency of the mounted object. (P. 5, ll. 2-8.) As such, the invention facilitates damping various objects having different bounce resonance frequencies by electronically altering the damping characteristics of the control system that controls the mount, thereby eliminating the need for physically redesigning the mount for different objects. (P. 4, ll. 3-7.)

Claim 24 of the present application is fully reproduced below:

> A method for controlling a hydraulic mount between an object and a base, the object having a bounce resonance frequency, the method comprising:
>
> calibrating at least one tunable parameter <u>of a control system</u> of the mount based on the bounce resonance frequency of the object;
>
> generating a first acceleration signal indicative of an acceleration of the object;
>
> generating a second acceleration signal indicative of an acceleration of the base;
>
> determining a relative acceleration across the mount based on the

> first and second acceleration signals;
>
> generating a control signal responsive to the determined relative acceleration based on the at least one tunable parameter; and
>
> controlling the flow of MR mount fluid in the mount responsive to the control signal to minimize the relative acceleration across the mount over a predetermined band of frequencies.

(Emphasis added.)

Thus, claims 24-30 require, among other things, calibrating the tunable parameters of the control system that controls the mount. Claims 38-46 include similar limitations.

In contrast, the Takano reference discloses a vibration damper charged with an electrorheologic fluid (i.e., a hydraulic fluid that changes viscosity when subjected to an electric field), wherein the viscosity of the electrorheologic fluid in an unactuated state (i.e., when no electric field is applied to the fluid) is selected to cope with the bouncing vibration of the engine mounted thereto. The relevant portion of the Takano reference – the portion cited by the Examiner – reads in its entirety:

> In a practical example of application of the invention, applied to an engine mount for mounting the engine on the chassis of an automobile, the engine may exhibit a bouncing vibration of a frequency on the order of 15 Hz and a rolling vibration of a frequency on the order of 7 Hz. In such a case, <u>the vibration damper may be constituted</u> such that the viscosity of the fluid is tuned to cope with the bouncing vibration of the engine without supplying the electric current to the electrode plates 46 and 48 and, when the rolling vibration occurs, the electric current is supplied to the electrode plates 46 and 48 in response to the rolling vibration so as to increase the viscosity of the fluid, thereby offsetting the position of the peak of the damping coefficient to a level near 7 Hz.

(Col. 8, ll. 8-21 (emphasis added).)

Thus, the Takano reference discloses physically designing the vibration damper such that the damper copes with the bouncing vibration of a specific engine when the damper is in an unactuated state.

Nonetheless, the Examiner argues that the Takano reference discloses "calibrating at least one tunable parameter (viscosity of fluid tuned to cope with rolling vibration, col. 8, lines 8-22)

of a control system of the mount." (Final Office action, p. 2 (emphasis added).) Therefore, the Examiner has taken the position that the "parameter [being tuned in the Takano reference] is the viscosity of the MR fluid" in the damper. (Final Office action, p. 7.)

The Examiner's argument is without merit. The claims of the present application require calibrating the tunable parameters of the control system that controls the mount – not calibrating the mount itself. By arguing that the Takano reference discloses tuning the viscosity of the fluid in the damper, the Examiner ignores the clear language in the claims requiring calibrating the tunable parameters of the control system. The Takano reference makes no mention whatsoever of calibrating the parameters of a control system.

It is axiomatic that anticipation under § 102(b) is established only if each and every limitation of a patent claim identically appears in a single prior art reference. *See Gechter v. Davidson*, 116 F.3d 1454, 1457 (Fed. Cir. 1997). Inasmuch as the Takano reference fails to disclose calibrating the tunable parameters of a control system that controls a mount, it is submitted that the Takano reference cannot, as a matter of law, anticipate the pending claims of the present patent application.

Accordingly, the rejections of claims 24-30 and 38-46 based on the Takano reference are clearly erroneous and should be reversed on appeal.

CONCLUSION:

For the foregoing reasons, the Examiner has failed to establish that claims 24-30 and 38-46 are anticipated by the Takano reference. As such, the rejections of claims 24-30 and 38-46 under 35 U.S.C. § 102(b) should be reversed.

Prompt and favorable action is respectfully requested.

Respectfully submitted,

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CLAIMS APPENDIX

24. A method for controlling a hydraulic mount between an object and a base, the object having a bounce resonance frequency, the method comprising:

calibrating at least one tunable parameter of a control system of the mount based on the bounce resonance frequency of the object;

generating a first acceleration signal indicative of an acceleration of the object;

generating a second acceleration signal indicative of an acceleration of the base;

determining a relative acceleration across the mount based on the first and second acceleration signals;

generating a control signal responsive to the determined relative acceleration based on the at least one tunable parameter; and

controlling the flow of MR mount fluid in the mount responsive to the control signal to minimize the relative acceleration across the mount over a predetermined band of frequencies.

25. The method of claim 24 wherein the predetermined band of frequencies occurs at and around the bounce resonance frequency of the object.

26. The method of claim 25 wherein calibrating at least one tunable parameter comprises tuning an objective function obtained by a sensitivity function.

27. The method of claim 26 wherein calibrating at least one tunable parameter comprises tuning a weighting function.

28. The method of claim 27 wherein the weighting function is limited to the bounce resonance frequency.

29. The method of claim 28 wherein calibrating at least one tunable parameter comprises tuning an associated scalable factor.

30. The method of claim 29 wherein the associated scalable factor is used to increase and

decrease the magnitude of the weighting function.

38. A system for controlling a hydraulic mount between an object and a base, the object having a bounce resonance frequency, the system comprising:

means for modifying at least one tunable parameter of a control system of the mount based on the bounce resonance frequency of the object;

means for generating a first acceleration signal indicative of an acceleration of said object;

means for generating a second acceleration signal indicative of an acceleration of said base;

means for determining a relative acceleration across the mount based on the first and second acceleration signals;

means for generating a control signal responsive to the relative acceleration based on the at least one tunable parameter; and

means for controlling the flow of MR fluid in the mount responsive to the control signal to minimize the relative acceleration across the mount over a predetermined band of frequencies.

39. The system of claim 38 wherein the predetermined band of frequencies occurs at and around the bounce resonance frequency of the object.

40. The system of claim 39 wherein the means for tuning at least one tunable parameter comprises an objective function obtained by a sensitivity function.

41. The system of claim 40 wherein the means for tuning at least one tunable parameter comprises a weighting function.

42. The system of claim 41 wherein the weighting function is based on the bounce resonance frequency.

43. The system of claim 42 wherein the means for tuning at least one tunable parameter

comprises an associated scalable factor.

44. The system of claim 43 where the associated scalable factor is used to increase and decrease the magnitude of the weighting function.

45. A control system for a hydraulic mount positioned between a vibrating object and a base, said vibrating object having a bounce resonance frequency, the system comprising:

means for generating a first acceleration signal indicative of an acceleration of said object;

means for generating a second acceleration signal indicative of an acceleration of said base;

means for determining a relative acceleration across the mount based on the first and second acceleration signals;

means for generating a control signal corresponding to the relative acceleration;

means for controlling the flow of MR fluid in the mount responsive to the control signal;

means for tuning the control system to minimize the relative acceleration across the mount at and around the bounce resonance frequency of the object.

46. The method of claim 24 wherein the calibrating step is performed electronically.

EVIDENCE APPENDIX

(None.)

RELATED PROCEEDINGS APPENDIX

(None.)